

Collecting, Processing & Storing Locally

Native Plant Seed in the  
Goulburn Broken Catchment



July 2004



**ISBN 0-9751335-1-9**

**Published by:** Goulburn Broken Indigenous Seedbank & North East Community Seedbank. **July 2004.**

**Disclaimer:**

This publication may be of assistance to you but the producers do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

**For more information contact:**

Goulburn Broken Indigenous Seedbank  
Tel. 03 5833 9279 or 0428 770 030

Or

North East Community Seedbank  
Tel. 0417 338 435

## A C K N O W L E D G E M E N T S

---

Key references\* used to compile this information were:

- Florabank Guidelines
- ATSC Operations Manual
- GA Seed Germination Data Sheets
- Goulburn Broken Revegetation Guide
- Seed Collection of Australian Native Plants
- Thanks to Sally Mann for her edits

\* See references & Further Reading on page 10 for full details

# TABLE OF CONTENTS

---

Collecting Locally	3
How Much to Collect	3
Know Your Plant	3
When to Collect	3
Recognising Mature Fruit and Seed	4
Collecting Methods	6
Ethics	7
Safety of the Job	8
Extracting and Cleaning Seed	8
Storing Seed	9
Contacts	10
References and Further Reading	10
Appendix 1: Seed Collection Field Data Sheet	12
Appendix 2: Recording Map References	13
Appendix 3: Seed Collection Calendar	14
Appendix 4: Propagating Local Plants for Revegetation	21
Appendix 5: Propagation Information for Goulburn Broken Victorian Species	25

Compiled by the Seedbank Coordinators of the Goulburn Broken  
Indigenous Seedbank & the North East Community Seedbank July 2004



## Introduction

---

This booklet covers the 'best practice' of Collecting, Processing, Storing & Propagating locally native seed. It should be a useful guide for those starting out as well as for the more experienced collector.

## Collecting Locally

---

It's important to try and match the environmental conditions of the seed collection site with those of the planting site so that your revegetation project has the best chance of thriving. Local plants from local seed will also complement other plants and wildlife in the area and pose the least threat of genetic contamination.

So how local is local? Generally, as local as possible! Look first at remnant vegetation in your district – on your property, on neighbouring farms, roadsides and reserves. Keep in mind your planting site – for creek plantings, collect from local creekside remnants, and for hill plantings, from local hillside remnants. Take notice of the local form of the species – as this is also a guide to the local collection range for your seed. Where distinct differences occur – restrict your collection to your local form.

If you have trouble locating remnant vegetation close to home you may have to go further afield. Try to collect from the same type of vegetation as occurs on your site. E.g. around Katamatite there is a very small proportion of original native vegetation left, but the Plains Grassy Woodland vegetation once found across that district extends for quite an area. You may travel some distance from your site, yet still be able to collect from the same vegetation type - which should result in a successful revegetation effort (<http://www.gbema.vic.gov.au/revegetation/index.html>).

## How Much to Collect

---

Decide how many plants you'd like to end up with so you can work out how long to spend collecting seed. You may only need ½ a teaspoon of eucalypt seed to grow several hundred plants, or a couple of teaspoons of wattle seeds. It may be wise to collect more than you need immediately and store your supply for later use – some years are better seeding years than others, and sometimes you may miss the seed of tricky species such as some native pea-flow-ers which eject their seed in a day or two!

## Know Your Plant

---

Make sure you know the identity of the parent plant before collecting it's seed. Several good field guides are available and there are plenty of local enthusiasts and experts who can help out with identifying species (see resources list at back). If unsure, collect a sample of leaves, fruits, flowers or buds pressed in a newspaper and present it to an expert, along with a description and location of the plant.

## When to Collect

---

Collection times vary between species and even within species (depending on the location eg. Golden Wattle at Nathalia is likely to ripen a few weeks before Golden Wattle at Broadford (due to the cooler conditions). The season will also influence how quickly fruit ripens (*refer appendix 3*).

While some species have seed available to collect any time (eg. tea-trees, bottlebrushes, some eucalypts), others have seed ready for only a day or two – typically during December and January. You will need to keep a close eye on how the fruit is ripening in your part of the world to make sure you don't miss out for some species.

# Recognising Mature Fruit and Seed

It is best (and often essential) to collect fully ripe (mature) seed. Experience is the best teacher of recognising ripeness but the following should be a good guide to get started:

## Woody capsules

eg. species of: *Eucalyptus*, *Leptospermum*, *Kunzea*, *Callistemon*, *Melaleuca*.

Upon ripening they generally:

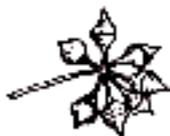
- change colour from green to grey or brown;
- reach their full size (refer to guide books);  
turn dry or woody;
- form visible valves which may start to split apart to release seed (although some never open until picked or damaged).



*Eucalyptus*

**Figure 1** shows the seed development that occurs in *Eucalyptus camaldulensis* (River Red Gum). It may take any time between 6-24 months for the entire process from flowering to mature seed set to occur in Woody capsule species.

Figure 1



1. Flower Buds



2. Flowers



3. Immature Fruits



4. Mature Fruits



5. Open Fruits

## Papery Capsules

eg. species of: *Bursaria*, *Dodonaea*, *Lomandra*, *Wahlenbergia*.

Upon ripening they generally:

- Change colour from green to light or darker brown;
- Remove easily from plant
- Turn dry and papery;
- Split apart to release seed.



*Lomandra & Dodonaea*

## Follicles

eg. Species of: *Hakea*, *Grevillea*, *Banksia*.

Upon ripening they generally:

- Turn from a green to a hard brown or grey;
- May form discernible valves which may open or split.



*Banksia*

## Nuts

eg. Species of: *Carex*, *Cyperus*, *Eleocharis*, *Ghania*.

Nuts often change colour, harden upon ripening, and are easily released from the plant.

## Seed pods

eg. Species of: *Acacia*, *Brachychiton*, *Daviesia*, *Dillwynia*, *Glycine*, *Hardenbergia*, *Indigofera*, *Pultenaea*, *Senna*.



*Acacia & Senna*

Upon ripening they generally:

- Change colour from green to light or darker brown (collect pea-flowers at this stage, just before they split open and eject their seed – consider bagging fruiting branches to capture seed);
- Reach their full size (refer to guide books);
- Turn dry and brittle;
- Start to split apart and curl to release seed (collect acacia seeds at this stage)

## Drupes

eg. Species of: *Eremophila*, *Persoonia*, *Leucopogon*

Upon ripening they generally:

- Release with gentle pressure.

## Berries

eg. Species of: *Atriplex*, *Dianella*, *Enchylaena*

Upon ripening they generally:

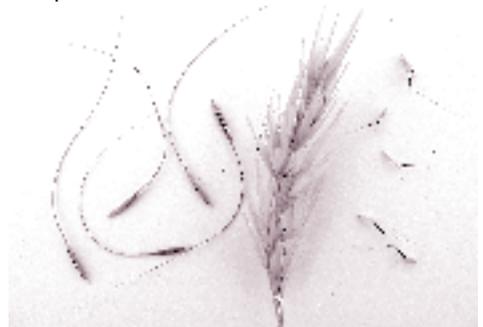
- Change colour from green to attractive blue/purple/red (collect at this stage);
- Change from hard to soft and pulpy;
- Are removed easily from plant with a gentle shake.

## Grains

eg. Species of: *grasses including Austroanthonia*, *Austrostipa*, *Themeda*.

Upon ripening they generally:

- Change to a brown colour
- Grain is removed easily from seedhead
- Whole seedhead becomes dry & brittle
- Many species have differential ripening of a period of time



*Austrostipa & Austroanthonia*

## Achenes

eg. species of: *Brachyscome*, *Cassinia*, *Clematis*, *Craspedia*, *Calocephalus*, *Oleria*, *Vittadinia*.

Upon ripening they generally:

- Change to a slight brown colour
- Release easily with slight pressure.

## Cones

eg. Species of: *Allocasuarina*, *Callitris*.

Upon ripening they generally:

- Turn from soft and green to hard and brown



*Callitris & Allocasuarina*

## Collecting methods

---

### Collecting by hand

#### Plants with pods

eg species of: *Acacia*, *Brachychiton*, *Daviesia*, *Dillwynia*, *Glycine*, *Hardenbergia*, *Indigofera*, *Pultenaea*, *Senna*.

Wear gloves to strip pods from branches into a bag or container. With wattles – can beat branches with a stick or shake them and capture seed on a drop sheet spread below.

#### Plants with woody fruits

eg species: of *Eucalypts*, *Allocasuanna*, *Hakeas*, *Callitris*.

Remove small branches, or individual fruit with secateurs.

#### Plants with fleshy fruit

eg species of: *Dianellas*, *Atriplex*, *Enchylaena*.

Pick ripe fruit off the branches by hand.

#### Plants with seedheads

eg species of: *Austrodanthonia*, *Austrostipa*, *Themeda*.

Strip seedheads off their stems by running a cupped hand along the seedheads in an upward motion, or cut them off with secateurs. Or for species of *Brachyscome*, *Cassinia*, *Clematis*, *Craspedia*, *Calocephalus*, *Oleria*, *Vittadinia* try flicking the seed into a bucket or paperbag with your fingers, or strip the seedhead by running a cupped hand up the stem

#### Natural seed fall (seed traps)

Lay tarpaulins out under plants with large seeds such as wattles. Useful technique for low, prickly shrubs such as Hedge Wattle. Need to check regularly as seed may be taken by predators or blown by wind if left too long.

Tie breathable bags around fruiting branches to capture seed which is shed within a day or two in hot weather eg. species of native pea-flowers. Need to check frequently as seed may be taken by predators. Stocking material is good for this technique.

### Collecting out of hand's reach

1. Be opportunistic: look out for storm-damaged trees and roadside lopping/cutting by local authorities.
2. Use long-handled pole pruners from the ground (these can be borrowed from the Seed bank).
3. Hire a cherry-picker (this could be an option for a group project).



*Collecting seed with long handled pole pruners.*

## Ethics

---

### Seek Permission

There are a number of permits which must be considered when collecting seed. For further information you may refer to DSE Landcare Note 'What permit do you need to collect local seed'.

Or contact the GBI Seedbank site for specific advice.

Always seek permission from the landowner if collecting from private land.

### Go for Genetic Diversity

Obtain the best genetic quality possible (ie. aim for a genetically diverse sample of your local plants rather than a narrow example of the local gene pool).

Where possible:

1. Collect only from natural rather than planted populations (where you may not know the genetics of the plants). This means collecting from healthy stands of remnant vegetation which you may find on private or public land (eg. road/rail reserves/parks etc);
2. Collect from genetically unrelated parent plants eg. trees at least 100 metres apart and shrubs at least 50 metres apart;
3. Do not collect from isolated individuals which may have a high proportion of in-bred seed;
4. Collect from at least 10-20 parent plants per seedlot;
5. Collect from different heights and from different sides of the plant.

### Keep good records

The GBI Seedbank requires the following records when receiving each seedlot: Collection No, Collection Site, including Nearest Locality, Number of Parent Plants Collected from Collection Date, Collector's Name, Ecological Vegetation Class, Site Aspect, Position on Slope, and Map Reference obtained from a CFA map book.

*(refer appendices 1 & 2)*

## Look after the bush

It's important to treat all areas of remnant vegetation with care to minimise damage. When collecting:

- watch where you walk to avoid damaging ground plants;
- don't prune or break foliage excessively;
- collect no more than 10% of available seed per plant so that plenty of seed remains for natural regeneration and for fauna;
- collect only what you'll need;
- never chop down trees just for their seed;
- be opportunistic – collect from fallen branches after stormy weather.

## Safety on the Job

The following should be taken into consideration when Collecting seed:

1. Public liability insurance should be considered when collecting on public land
2. Wear brightly coloured clothing when collecting from roadsides ie orange vest
3. Place signs near you roadside collection site to forewarn on-coming vehicles
4. Park your vehicle completely off the road, & away from any blind corners
5. Never remove branches over a road
6. Carry a fully equipped First Aid Kit
7. Carry a communication method ie mobile phone or 2-way radio.
8. Wear long pants, long-sleeved shirt, closed in boots, hat, gloves & eye protection gear
9. Carry & use adequate sun protection
10. Collect with another individual, when possible, or notify someone of your intended work location/s for the day.

The following should also be taken into consideration when cleaning seed:

1. Process in a well ventilated room
2. Wear eye & dust masks
3. Be aware of any potentially harmful insects that may be found in the seed lot
4. Have a fully equipped 1st Aid Kit on hand.

## Extracting and Cleaning Seed

This involves removing the seed from it's fruit. Freshly collected seed is particularly vulnerable to deterioration as it usually has a high moisture content and can go moldy. It is also prone to predation from insects brought in with the fruiting material from the field.

### Natural Drying

Dry small quantities in envelopes/paper bags or open containers at 15°-30°C in an area with good air circulation.

For large quantities, spread fruit out on tarpaulins in a dry area (direct sun is fine) and turn regularly to ensure even drying, and prevent moisture build-up (and mould growth). Pack the tarps away at night to avoid moisture problems and watch out for bad weather. Extract as soon as possible as seed is vulnerable to predation by insects including ants and mice/birds.



## Artificial Drying

Greenhouses or igloos are useful. Ensure air circulation is good to keep humidity low, and that the temperature does not exceed 38°C (*Banksias* will need high temps for a short time to open – try drying in the oven).

## Plants with Woody fruits

*(Eucalyptus, Allocasuarinas, Banksias, Callitris, Hakeas etc).*

The seed will drop as the fruit dries out and the valves open (usually within a week). For casuarinas, remove all branchlets (needles) from the cones immediately following collection, as these are very difficult to remove once the seed has dropped. After the seed has dropped, extract it by sieving.

## Plants with Pods

*(Wattles, Pea-Flowers etc), or soft capsules (mat rushes).*

Seed is easier to separate from brittle pods – so make sure pods are fully dry. Use gloves to rub pods and then sieves and winnowing to extract seed. The Seedbank has cleaners that can be used to clean wattle seed to a good standard.

Flotation is another method of achieving clean wattle seed. Immerse the material quickly in water and then skim off surface material (good seed sinks). Dry seed well before storing.

## Plants with Fleshy Fruit

*(Dianellas etc)*

Soak the fruit in water for several days until mould appears. Use sieves and water to extract seed from the fruit pulp and skin.

## Plants with Seedheads

*(Daisies, Grasses etc)*

Pick out stems, rub between gloved hands.

## Storing Seed

---

Quality, press-seal bags (available from the supermarket) are the best low-cost option for storing seed. Glass storage jars with a rubber seal under the lid are also good.

Key elements involved in storage are:

- a. Seed moisture content
- b. Storage temperature
- c. Storage atmosphere (oxygen)
- d. Protection against pests & diseases

## Seed Moisture Content

Single most important factor in preserving seed. Seed must be dry before storing. For small quantities of seed silica gel sachets can be used to finish off the drying. Use a ratio of about 2:3 gel to seed.

## Storage Temperature

The majority of species can be stored at room temperature, as long as it is fairly constant (minimise fluctuations). There are however a number of exceptions, which require to be stored in a refrigeration, at a temperature 2-5.C (*refer Appendix 3*).

Ensure seed is stored in airtight containers if refrigerating it, to keep moisture out. If using press-seal bags – use a few per seedlot as these do allow moisture in over time.

## Storage atmosphere (oxygen) & protection from pests

The GBI Seedbank uses a specially designed CO gas unit to remove unwanted insects from affected seedlots. This unit is available for anyone to use at the Seedbank.

Or refer to [www.florabank.org.au](http://www.florabank.org.au) For further information.

To slow the seed respiration rate, oxygen needs to be excluded from the atmosphere around the seed. Try to exclude as much oxygen as possible when sealing them into a bag or container (ie. fill the container as much as possible with seed).

## Assessing Seed Quality

Firstly, have a good look at your seed. Take a spoonful and spread it out on a table under good light (a hand lens may help) and look for:

- Insects
- Signs of fungus.

There are two quick tests you can use to give an idea of the seeds viability (ie. whether the seed is dead or alive):

### Cut test

Randomly select 25 seeds. Use a sharp blade to cut right through the seed. A small hand lens may help you to count the number of seeds that are firm and creamy-white (viable seeds).

### Squeeze test

Useful for fine seeds such as eucalypts, tea trees and bottlebrushes. Soak a sample of seeds in water for 2-4 days. Drain off the water and squeeze each seed gently between tweezers. Count the firm creamy-white seeds.

A full germination test will give a much better indication of seed quality, but is more complicated.

Or refer to [www.florabank.org.au](http://www.florabank.org.au)  
For further information.

## Contacts

---

### ***Goulburn Broken Indigenous Seedbank***

(03) 5833 9279  
0428 770030

### ***Department of Primary Industries/ Department of Sustainability & Environment***

***Benalla Office***  
(03) 5761 1611

***Tatura Office***  
(03) 5833 5222

### ***GB Catchment Management Authority***

Head Office Shepparton  
(03) 5822 2288

### ***Trust For Nature***

(03) 5761 558

\* Don't forget all the other plant enthusiasts and experts out there who don't happen to be working for the above organisations

## References & Further Reading

---

Australian Tree Seed Centre,  
1999, Florabank Guideline 2. ***Basic Methods for Drying, Extraction and Cleaning of Native Plant Seed***, Yarralumla, ACT.

Australian Tree Seed Centre & Mortlock, W.,  
1999, ***Florabank Guideline 6. Native Seed Collection Methods***, Yarralumla, ACT.

Australian Tree Seed Centre & Mortlock, W.,  
1999, ***Florabank Guideline 8. Basic Germination and Viability Tests for Native Plant Seed***, Yarralumla, ACT.

Bloomberry, A.M. & Maloney, B.  
1994, ***Propagating Australian plants***, Kangaroo Press, Kenthurst.

Cole, I., Dawson, I., Mortlock, W. & Winder, S.,  
2000, ***Florabank Guideline 9. Using Native Grass Seed in Revegetation***, Yarralumla, ACT.

Department of Natural Resources & Environment,  
2002, ***Managing Your Patch of Bush***, Wodonga.

Earl, G  
et-al (ed), 2001, ***Revegetation Guide for the Goulburn Broken Catchment, Department of Natural Resources & Environment***, Melbourne.  
<http://www.gbcm.vic.gov.au/revegetation/>

Greening Australia Victoria,  
1996, 1997, 1998, *Seed Germination Data Sheets: The Acacias; The Eucalypts; Indigenous Grasses; The Daisy Family (Asteraceae); Shrubs of the Myrtaceae Family in Victoria; The Lily Family (Liliaceae); The Pea Family (Fabaceae); Wetland Plants; Smoke as a Seed Pretreatment*, Melbourne.

Gunn, B.,  
2001, *Australian Tree Seed Centre Operations Manual*, CSIRO Forestry and Forest Products, Canberra.

Handreck, K. A. & Black, N. D.  
2002, *Growing media for ornamental plants and turf*, 3rd edn. Kensington, NSW, NSW University

Hartmann, H. T., Kester, D. E., Davies, F. T. & Geneve, R. L.  
2002, *Plant propagation: principles and practices*, 7th edn. Prentice Hall International, Upper Saddle River.

Mortlock, W. & Australian Tree Seed Centre,  
1999, *Florabank Guideline 3. Improving on Native Seed*, Yarralumla, ACT

Mortlock, W. & Australian Tree Seed Centre,  
1999, *Florabank Guideline 4. Keeping Records on Native Seed*, Yarralumla, ACT.

Mortlock, W. & Australian Tree Seed Centre,  
1999, *Florabank Guideline 5. Seed Collection from Woody Plants for Local Revegetation*, Yarralumla, ACT.

Mortlock, W. & Australian Tree Seed Centre,  
1999, *Florabank Guideline 7. Seed Production Areas for Woody Plants in Revegetation*, Yarralumla, ACT.

Mortlock, W. & Hawkesbury-Nepean Catchment Management Trust, 2000, *Florabank Guideline 10. Seed Collection Ranges for Revegetation*, Florabank and the Hawkesbury-Nepean Catchment Management Trust.

Ralph, M.,  
1994, *Seed Collection of Australian Native Plants*. 2nd ed., Murray Ralph, Melbourne.

Ralph, M.,  
2003, *Growing Australian Native Plants from Seed*, 2nd Edition, Murray Ralph/Bushland Horticulture, Melbourne.

Stewart, D. & Stewart, R.E.  
1995, *From seeds to leaves*, Agmedia, Melbourne.

## Web Sites

---

Association of Societies for Growing Australian Plants, <http://farrer.riv.csu.edu.au/ASGAP/index.html>

Florabank, <http://www.florabank.org.au>

Goulburn Broken Catchment Management Authority, <http://www.gbema.vic.gov.au>

## CD

---

Floradata; a guide to collection, storage and propagation of Australian native plant seed, [www.florabank.org.au/floradata.htm](http://www.florabank.org.au/floradata.htm)

# Appendix 1:

---

Seed Collection Field Data Sheet used by the Goulburn Broken Indigenous Seedbank

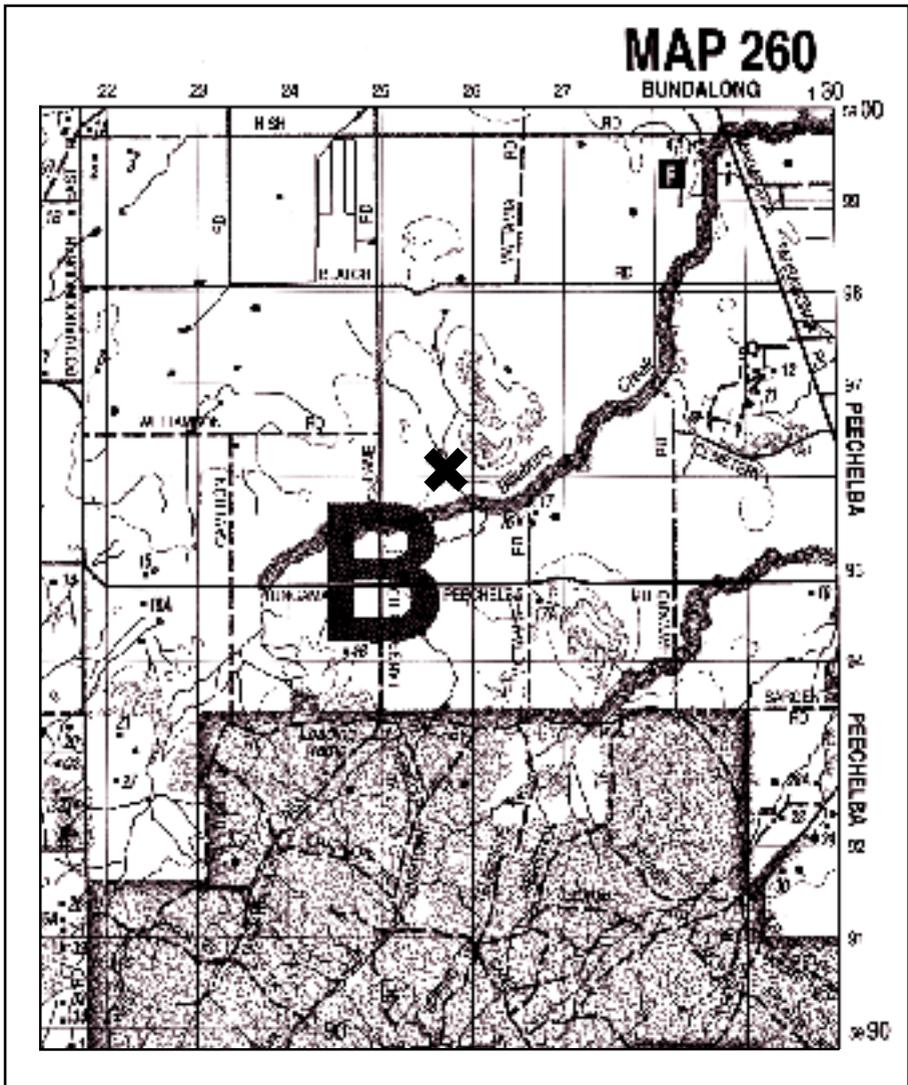
<b>Species:</b>	<b>Collection number:</b>		
<b>Project:</b>	<b>Date collected:</b>		
<b>Site name (closest town):</b>	<b>Map reference:</b>	<b>GPS:</b>	
<b>Location (road or landmark):</b>	<b>Vegetation:</b> Remnant      Planted	<b>Land use:</b> Public      Private	
<b>Abundance:</b> Dominant    Abundant    Common    Uncommon    Rare    Solitary			
<b>Size of population:</b> 1-10      10-100      100+		<b>Number of plants collected from:</b> 1-10      10-100      100+	
<b>Seed crop quantity:</b> Heavy      Medium      Light		<b>Seed crop timing</b> Early      Peak      Late	
<b>Vegetation type (dominant species, EVC):</b>		<b>Geology:</b>	
<b>Position on slope:</b> Watercourse    Flat    Lower slope    Upper slope    Crest		<b>Aspect:</b> N    NE    E    SE    S    SW    W    NW	
<b>Soil description:</b> Sand      Clay      Loam		<b>Soil colour:</b>	
<b>Date cleaned</b>	<b>Grams:</b>	<b>Delivery:</b>	<b>Deposit:</b>
<b>Collector name:</b>	<b>Signature:</b>		



## Appendix 2:

### Recording Map References

The GBI Seedbank requires that a CFA mapbook reference be recorded for each lot of seed entering the seedbank. This is a 9 digit number which records the page number followed by a grid reference number, easting and northing. The following is a portion of a CFA map. The location marked 'X' would be recorded as 260-258, 963.



# Appendix 3:

## Seed Collection Calendar

### Key to Seed Held:

- \* ripe seed shed within about 2-3 days
- \*\* ripe seed shed within about 2 weeks
- \*\*\* ripe seed shed within about 1-4 months
- \*\*\*\* ripe seed retained on the plant year-round.

**Note:** Times given may not be totally accurate and should be used as a guide only. Exact collection dates will vary across the catchment. With knowledge & experience in your local area you will learn to identify the most appropriate collection times.

## Trees

Species	Common Name	Collection Time	Seed Held	Notes
<i>Acacia implexa</i>	Lightwood	Mid spring-autumn	**	Takes 11 months from flowers to seeds. Dust can irritate.
<i>A.mearnsii</i>	Black Wattle	Early Dec-mid Feb	**	Frequently produces heavy crops.
<i>A.melanoxylo</i>	Blackwood	Mid Dec -late Feb	***	Seed may be retained until late winter, although insects eat large amounts.
<i>Allocasuarina luehmannii</i>	Buloke	Dec-May		Seed shed in late summer. Store immediately in fridge at 2-5.C
<i>Allocasuarina verticillata</i>	Sheoke	Through-out year.	****	Store immediately in fridge at 2-5.
<i>C. Callitris endlicheri</i>	Black Cypress Pine			
<i>C. glaucophylla</i>	White Cypress Pine	Nov-Apr	***	Seed held 1-2 months. Store immediately in fridge at 2-5.C
<i>Eucalyptus albens</i>	White Box	Sum-aut	***	
<i>E. behriana</i>	Bull Mallee	Throughout the year		
<i>E. blakelyi</i>	Blakleys Red Gum	Feb-Jun	***	
<i>E. bridgesiana</i>	Apple box	Jun-Feb	***	
<i>E. cadens</i>	Warby Swamp Gum		***	
<i>E. camaldulensis</i>	River Red Gum	Mar-Sep	***	Collection times vary.
<i>E. camphora</i>	Mountain Swamp Gum	Mar-Jun	***	
<i>E. crenulata</i>	Buxton Gum		****	
<i>E. dalrympleana</i>	Mountain Gum	Throughout yr		
<i>E. dives</i>	Broad-leaved Peppermint	All year, esp. autumn	****	
<i>E. froggattii</i>	Kamarooka Mallee	Throughout yr		
<i>E. globoidea</i>	White Stringybark	Jul-Jan	***	
<i>E. globulus</i>	Eurabbie/Blue Gum	Jan-Jun	***	
<i>ssp. bicostata</i>				

Species	Common Name	Collection Time	Seed Held	Notes
<i>E. goniocalyx</i>	Long-leaf Box	All year	****	
<i>E. largiflorens</i>	Black Box	Throughout yr		
<i>E. leucoxydon subsp. pruinosa</i>	Yellow Gum	Mid Feb-Late May	***	
<i>E. macrorhyncha</i>	Red Stringybark	All year, esp. summer	****	May need high temperatures to extract seed
<i>E. mannifera</i>	Brittle Gum		***	
<i>E. melliodora</i>	Yellow Box	Nov-Apr	***	If possible store in fridge
<i>E. microcarpa</i>	Grey Box	Nov-Aug	***	Heavy crops may be irregular
<i>E. mannifera</i>	Brittle Gum		***	
<i>E. melliodora</i>	Yellow Box	Nov-Apr	***	
<i>E. microcarpa</i>	Grey Box	Nov-Aug	***	Heavy crops may be irregular
<i>E. nortonii</i>	Silver Bundy	All year	****	
<i>E. obliqua</i>	Messmate Stringybark	Most times	***	Abundant seeder, store in fridge.
<i>E. ovata</i>	Swamp Gum	Early Oct-Late Mar	**	
<i>E. pauciflora</i>	Snow Gum	summer	***	
<i>E. polyanthemos</i>	Red Box	Dec-Sep	***	Store in fridge.
<i>E. radiata</i>	Narrow-leaf Peppermint	Best Aug-Apr	***	
<i>E. rubida</i>	Candlebark	Jan-Sep		
<i>E. sideroxydon</i>	Mugga Ironbark	Aug-Feb	***	Seed shed after 1-2 months
<i>E. stellulata</i>	Black Sallee	All year	****	
<i>E. tricarpa</i>	Red Ironbark	Aug-Feb	***	
<i>E. viminalis</i>	Manna Gum	Sep-Mar	***	Seed shed after 1-2 months. Heavy crops every 2-3 years.
<i>E. viridis subsp. viridis</i>	Green Mallee	Throughout yr	****	
<i>Pittosporum phylliraeoides</i>	Weeping Pittosporum	Feb-Jun		Splits open to reveal red seeds

## Shrubs

Species	Common Name	Collection Time	Seed Held	Notes
<i>Acacia acinacea</i>	Gold-dust Wattle	Dec	**	Often produces little seed.
<i>A. aculeatissima</i>	Thin-leaf Wattle	Dec	**	
<i>A. aspera</i>	Rough Wattle	Nov-Jan	*	Use sheet and shake branches.
<i>A. brachybotrya</i>	Grey Mulga	Mid Nov-Late Jan	*	
<i>A. buxifolia</i>	Box-leaf Wattle	Dec-Mid Jan	**	

Species	Common Name	Collection Time	Seed Held	Notes
<i>A. calamifolia</i>	Wallowa	Mid Nov-Mid Feb	*	
<i>A. dealbata</i>	Silver Wattle	Late Nov-mid Jan	**	Large crops every 2-3 years. Rarely sets seed.
<i>A. difformis</i>	Drooping Wattle			
<i>A. doratoxylon</i>	Currawang	Dec-Jan		
<i>A. flexifolia</i>	Bent-leaf Wattle	Nov-Dec	**	
<i>A. genistifolia</i>	Spreading Wattle	Late Nov-Late Dec	**	
<i>A. gunnii</i>	Ploughshare Wattle	Late Nov-Early Jan	**	
<i>A. hakeoides</i>	Hakea Wattle	Early Dec-Late Jan	**	
<i>A. lanigera</i>	Woolly Wattle	Late Nov-Jan	**	
<i>A. leprosa</i>	Cinnamon Wattle	Early Dec-Early Jan	**	
<i>A. mitchelli</i>	Mitchell's Wattle	Dec-Mar	**	Seed takes months to mature.
<i>A. montana</i>	Mallee Wattle	Mid Nov-Mid Dec		
<i>A. mucronata</i>	Narrow-leaf Wattle	Mid Dec-Mid Jan	*	Unreliable in setting seed.
<i>var. longifolia</i>				
<i>A. paradoxa</i>	Hedge Wattle	Early Dec-mid Jan	**	Best to shake seed onto ground sheet. Use gloves.
<i>A. penninervis</i>	Hickory Wattle	Feb-May	**	
<i>var. penninervis</i>				
<i>A. pravissima</i>	Ovens Wattle	Early-late Dec	**	
<i>A. pycnantha</i>	Golden Wattle	Nov-Jan	**	Frequently produces large crops.
<i>A. retinodes</i>	Wirilda	Dec-Jan	**	Frequently produces large crops.
<i>var. retinodes</i>				
<i>A. rubida</i>	Red-Stem Wattle	Early Nov-late Dec	**	
<i>A. siculiformis</i>	Dagger Wattle	Dec-Feb	**	
<i>A. triptera</i>	Spur-wing Wattle	Nov-Jan	*	
<i>A. ulicifolia</i>	Juniper Wattle	Nov-Jan	**	
<i>A. verniciflua</i>	Varnish Wattle	Dec-Jan	**	
<i>Atriplex semibaccata</i>	Berry Saltbush	Early Jan-Mar	**	When fruits are red.
<i>Baeckea utilis</i>	Mountain Baeckea		*	
<i>Banksia marginata</i>	Silver Banksia	Early Feb-late April	***	Released within 2 months.
<i>Billardiera scandens</i>	Common Apple-berry		**	Ripe berry pale yellow & pulpy.
<i>var. scandens</i>				
<i>Bursaria lasiophylla</i>	Hairy Bursaria	Jan-May	**	Store in fridge at 2-5.C
<i>B. spinosa</i>	Sweet Bursaria	Jan-May	**	When ripe fruit rattles. Store in fridge at 2-5.C
<i>Callistemon pallidus</i>	Lemon Bottlebrush	All year	****	When capsules turn brown
<i>C. pityoides</i>	Alpine Bottlebrush	All year	****	When capsules turn brown
<i>C. sieberi</i>	River Bottlebrush	All year	****	When capsules turn brown
<i>Calytrix tetragona</i>	Common Fringe-myrtle	Sep-Mar	**	When capsules turn bronze and begin to fall.

Species	Common Name	Collection Time	Seed Held	Notes
<i>Cassinia aculeata</i>	Common Cassinia	Jan-Mar	**	
<i>C. arcuata</i>	Drooping Cassinia	Feb-Jun	**	
<i>C. longifolia</i>	Shiny Cassinia	Jan-Mar	**	
<i>Clematis aristata</i>	Mountain Clematis	Dec-Mar	**	
<i>C. microphylla</i>	Small-leaved Clematis	Dec-Mar	**	
<i>var. microphylla</i>				
<i>Coprosma hirtella</i>	Rough Coprosma			
<i>C. quadrifida</i>	Prickly Currant-bush	Dec-Feb		When fruit reddish -orange.
<i>Correa lawrenciana</i>	Mountain Correa		*	When berries red.
<i>C. reflexa</i>	Common Correa	Early Nov-Late Feb	*	
<i>Daviesia benthamii</i>	Spiny Bitter-pea	Dec-Jan	*	
<i>subsp. humilis</i>				
<i>D.latifolia</i>	Hop Bitter-pea	Dec-Jan	*	Bag fruit to capture seed.
<i>D. leptophylla</i>	Narrow-leaf Bitter-pea	Dec	*	" "
<i>D. ulicifolia</i>	Gorse Bitter Pea	Nov-Jan	*	" "
<i>Dillwynia cinerescens</i>	Grey Parrot-pea	Oct-Feb	*	" "
<i>D. juniperina</i>	Prickly Parrot-pea	Oct-Feb	*	" "
<i>D. phyllicoides</i>	Small-leaf Parrot-pea	Oct-Feb	*	" "
<i>D. sericea</i>	Showy Parrot-pea	Oct-Feb	*	" "
<i>Dodonaea boroniifolia</i>	Hairy hop-bush	Nov-Apr	**	
<i>D. viscosa</i>	Narrow-leaf Hop-bush	Oct-Feb	**	When papery capsules are crisp.
<i>ssp. angustissima</i>				
<i>D. viscosa ssp. cuneata</i>	Wedge-leaf Hop-bush	Oct-Feb	**	
<i>Einadia hastata</i>	Saloop	Dec-Jan	**	
<i>E. nutans subsp. nutans</i>	Nodding Saltbush	Dec-Jan	**	When berries red or orange.
<i>Enchylaena tomentosa</i>	Ruby Saltbush	Late Oct-Late April	**	When berries red.
<i>var. tomentosa</i>				
<i>Epacris species</i>	Heath	Oct-Feb	*	Difficult to propagate by seed.
<i>Eremophila longifolia</i>	Berrigan	Jan-Mar	**	
<i>Eutaxia diffusa</i>	Spreading Eutaxia	Dec	*	
<i>E. microphylla</i>	Common Eutaxia	Nov-Feb	*	Bag fruit to capture seed.
<i>Gompholobium huegelii</i>	Common Wedge-pea	Dec-Jan	*	
<i>Goodenia ovata</i>	Hop Goodenia	Early Dec-Late Jan	**	
<i>Hakea microcarpa</i>	Small-fruit Hakea			
<i>Hardenbergia violacea</i>	Purple Coral-pea	Dec-Jan	*	Bag fruit to capture seed.
<i>Hymenathera dentata</i>	Tree Violet	Dec-Apr	**	Ripe berries are pale green to purple.
<i>Indigofera australis</i>	Austral Indigo	Dec-Jan	*	Bag fruits to capture seed.
<i>I. adesmifolia</i>	Tick Indigo	Dec-Jan	*	Bag fruits to capture seed.

Species	Common Name	Collection Time	Seed Held	Notes
<i>Kunzea ericoides</i>	Burgan	Feb-Mar	**	Shake outer fruiting branches into bags.
<i>K. parvifolia</i>	Violet Kunzea	Jan-May	**	
<i>Leptospermum brevipes</i>	Slender Tea-tree	All year	****	
<i>L. continentale</i>	Prickly Tea-tree	All year	****	
<i>L. grandifolium</i>	Mountain Tea-tree	All year	****	
<i>L. lanigerum</i>	Woolly Tea-tree	All year	****	
<i>L. myrsinoides</i>	Heath Tea-tree	Jan-Apr	**	Drops seed when ripe.
<i>L. obovatum</i>	River Tea-tree	All year	****	
<i>Maireana decalvans</i>	Black Cotton-bush	Summer		
<i>M. enchylaenoides</i>	Wingless Bluebush	Summer		
<i>Melaleuca parvistaminea</i>	Rough-barked Honey-myrtle	All year	****	
<i>Mirbelia oxylobioides</i>	Mountain Mirbelia	Dec-Jan	*	
<i>Muehlenbeckia florulenta</i>	Tangled Lignum	Jan-Apr		
<i>Myoporum montanum</i>	Waterbush	Feb-Mar	**	Difficult to propagate by seed.
<i>Olearia species</i>	Daisy-bush	Oct-Jan	**	
<i>Ozothamnus ferrugineus</i>	Tree Everlasting	Jan-Mar	**	
<i>O. obcordatus</i>	Grey Everlasting	Dec-Jan	**	
<i>Platylobium formosum</i>	Handsome Flat-pea	Dec	*	
<i>Pomaderris spp.</i>	Pomaderris	Dec-Jan	**	
<i>Prostanthera lasianthos</i>	Victorian Christmas Bush	Jan	*	
<i>Pultenaea species</i>	Bush-pea	Oct-Feb	*	Bag fruit to capture seed.
<i>Senna artemisioides</i>	Desert Cassia	Dec-Mar	**	

## Grasses, sedges, rushes and perennial lilies

Species	Common Name	Collection Time	Seed Held	Notes
<i>Amphibromus spp.</i>	Swamp Wallaby-grass	Dec-Jan	**	
<i>Aristida spp.</i>	Wire Grass	Summer	**	Seeds turn pale purple & fall to ground in tangled mass.
<i>Austrodanthonia spp.</i>	Wallaby Grass	Dec-Jan	**	Collect when seedhead turn whitish & start to disintegrate.
<i>Austrostipa spp.</i>	Spear Grass	Dec-Feb	**	Collect when seeds part from seedhead easily.
<i>Bothriochloa macra</i>	Red-leg Grass	Dec-Feb	**	
<i>Carex spp.</i>	Sedges	Dec-Mar		

Species	Common Name	Collection Time	Seed Held	Notes
<i>Chloris truncata</i>	Windmill Grass	Dec-Mar	**	
<i>Cyperus lucidus</i>	Leafy Flat-sedge	Feb-Apr	**	
<i>Dianella longifolia</i> <i>var. longifolia</i>	Pale Flax-lily	Dec-Feb		Ripe berries are pale blue. Seed viable for 6-12 months.
<i>D. revoluta var. revoluta</i>	Black-anther Flax-lily	Dec-Jan		Ripe berries are pale blue. Seed viable for 6-12 months.
<i>D. tasmanica</i>	Tasman Flax-lily	Jan-Feb		Ripe berries are pale blue. Seed viable for 6-12 months.
<i>Dichelachne spp.</i>	Plume-grass	Dec-Apr	**	
<i>Eleocharis spp.</i>	Spike-sedge	Mid-Late Jan	**	
<i>Elymus scaber</i>	Tall Wheat-grass	Early-Late Dec	**	
<i>Enneapogon nigricans</i>	Nigger-heads	Oct-Jan	**	
<i>Enteropogon acicularis</i>	Spider Grass		**	
<i>Joycea pallida</i>	Red-anther Wallaby Grass	Dec-Jan	**	
<i>Juncus spp.</i>	Rushes	~ Dec-Jan		
<i>Lomandra filiformis</i>	Wattle Mat-rush	Jan-Feb	**	
<i>L. longifolia</i>	Spiny-headed Mat-rush	Dec-Mar	**	
<i>L. multiflora</i>	Many-flowered Mat-rush	Oct-Mar	**	
<i>Microlaena stipoides</i>	Weeping Grass	Dec-Apr	***	
<i>Phragmites australis</i>	Common Reed	Apr-Oct		
<i>Poa spp.</i>	Tussock Grass	Dec-Feb		
<i>Themeda triandra</i>	Kangaroo Grass	Dec-Jan		
<i>Xanthorrhoea australis</i>	Austral Grass-tree	Dec-Jan		Cut seed spike and lay on groundsheet out of weather for seed to shed.
<i>X. minor</i>	Small Grass Tree	Dec-Jan		" "

## Herbaceous species

Species	Common Name	Collection Time	Seed Held	Notes
<i>Ajuga australis</i>	Austral Bugle	Dec-Jan		
<i>Arthropodium spp.</i>	Chocolate and Vanilla Lilies	Summer	**	
<i>Brachyscome basaltica</i>	Swamp Daisy	Summer		
<i>Bracteantha bracteata</i>	Golden Everlasting	Dec-Jan	*	Dispersed by wind
<i>Bractenatha viscosa</i>	Sticky Everlasting	Dec-Jan	*	Dispersed by wind
<i>Brunonia australis</i>	Blue Pincushion	Mid Dec-Mid Jan	**	
<i>Bulbine bulbosa</i>	Bulbine Lily	Nov-Jan	**	

Species	Common Name	Collection Time	Seed Held	Notes
<i>Burchardia umbellata</i>	Milkmaids	Dec-Jan	**	
<i>Calotis scapigera</i>	Tufted Burr-daisy	Nov-Mar	***	
<i>Calocephalus citreus</i>	Lemon Beauty-heads	Jan-Feb	**	
<i>Cheiranthra cyanea</i> <i>var. cyanea</i>	Blue Finger-flower	Jan-Feb		
<i>Chrysocephalum</i> <i>apiculatum</i>	Common Everlasting	Dec-Mar	**	
<i>Chrysocephalum</i> <i>semipapposum</i>	Clustered Everlasting	Dec-Jan	**	
<i>Convolvulus erubescens</i>	Pink Bindweed	Mid Jan-Late Feb	**	
<i>Craspedia spp.</i>	Billy-buttons	Nov-Dec	**	
<i>Eryngium ovinum</i>	Blue Devil	Jan-Feb	**	
<i>Glycine clandestina</i>	Twining Glycine	Oct-Feb	*	
<i>Glycine tabacina</i>	Variable Glycine	Oct-Feb	**	
<i>Isotoma axillaris</i>	Rock Isotome	Nov-Apr	***	
<i>Kennedia prostrata</i>	Running Postman	Dec-Feb	**	
<i>Leptorhynchos</i> <i>squamatus</i>	Scaly Buttons	Nov-Dec	**	
<i>Lythrum salicaria</i>	Purple Loosestrife	Nov-Feb		
<i>Pelargonium australe</i>	Austral Stork's-bill	Dec-Apr	**	
<i>Pelargonium</i> <i>rodneyanum</i>	Magenta Stork's-bill	Dec-Apr	**	
<i>Pycnosorus globosus</i>	Drumsticks	Nove-Dec	**	
<i>Rhodanthe</i> <i>corymbiflora</i>	Paper Sunray	Oct-Jan	**	
<i>Stypandra glauca</i>	Nodding Blue-lily	Dec	**	
<i>Swainsona spp.</i>		Nov-Jan	*	
<i>Thysanotus patersonii</i>	Twining Fringe-lily	Nov-Dec		
<i>Wahlenbergia spp.</i>	Bluebell	Dec-Jan	**	

## References:

Greening Australia, 1996-1998,  
*Seed Germination Data Sheets.*

Ralph, M., 1993,  
*Seed collection of Australian Native Plants for  
Revegetation, Tree Planting & Direct Seeding*  
(2nd ed.) Bushland Horticulture, Fitzroy.

Earl, G et-al (ed), 2001,  
*Revegetation Guide for the Goulburn Broken  
Catchment*, Department of Natural Resources &  
Environment, Melbourne.

# Appendix 4:

---

## Propagating Local Plants for Revegetation

John Delpratt

### Introduction

Revegetation using local species aims to produce diverse, robust plant communities that establish quickly, suppress weed invasion and grow to resemble, function and regenerate in a manner similar to natural vegetation. Plant communities can be constructed by sowing seed directly onto the site, by planting container stock, or by a combination of both. When all or part of the vegetation is to be planted from container stock, one of the most important and rewarding activities in revegetation is propagating and growing good quality locally-indigenous plants.

This chapter introduces contemporary plant propagation and production methods suitable for the reliable supply of the diverse range of plants needed for most revegetation projects.

### Container plant production

By using an appropriate combination of propagation technique, growing environment, growing medium and container design, most plants, from trees and shrubs to vines, tussock grasses and colourful herbaceous wildflowers, can be started in containers and transplanted into a prepared revegetation site.

#### Containers

A container must provide a stable root environment, adequate drainage and a design that avoids or delays root circling and pot binding. There are many container systems available for growing plants. Many are very good; none is perfect. You must consider the number and range of plants to be grown, the environment under which the plants will be grown, the revegetation site conditions, whether the containers are to be reused and, of course, their cost. If trees and shrubs are to be grown, it is critical that the

internal surface of the container is designed to stop roots from circling. Do not use plastic pots or tubes that have smooth internal surfaces. Internal vertical ribs, vertical slots and internal surfaces treated with paints containing copper compounds are among the modifications that can reduce and delay root circling. Most commercial containers are semi-rigid plastic. They may be single containers, moulded blocks of various numbers of cells or rigid frames designed to securely hold sets of individual tubes.

#### Potting mixes

Soil, by itself, does not make a good container medium and most propagators avoid its use altogether. In a container, most soils quickly lose their structure and their capacity to drain freely. This leads to slow growth by the plant. Also, there is an increased risk that root diseases, such as *Phytophthora*, will establish in the container and either kill the young plant or be transferred to the revegetation site where its effects can be devastating. Soil is likely to carry weed seeds. Weeds will be a problem during production and weed seeds will be transferred to the planting site. High quality mixes based on composted wood wastes are readily available in south-eastern Australia. They are designed to allow for rapid growth and, if manufactured and stored correctly, they are free of weed seeds. Retail potting mixes that meet the Australian standards display the Standards Australia logo on the bag.

#### Nutrition

Major plant nutrients can be supplied easily and uniformly using one of the commonly available controlled release fertilisers. These products come in a range of nutrient formulations and release times. Choose a product with a release time that matches the time your plants will be in the container. Formulations are available for plants with a low tolerance of phosphorous such as some of the wattles, banksias and peas. Depending on your growing medium, your plants may benefit from the addition of micronutrients, also available in convenient commercial formulations.

## Plant propagation

Our aim when propagating indigenous plants for revegetation is to produce the required range and numbers of healthy plants. These plants must be capable of establishing quickly when transplanted into the revegetation site.

While seed is the most common propagation material, a number of other techniques can be considered if seed is not available or is difficult to use. The overriding consideration is that the chosen technique is used in a way that maintains most of the local genetic diversity of the species.

### Collecting propagation material

A characteristic of many plant communities is that they contain diversity both in their range of species and within each species. The diversity within a species may include subtle adaptations to local environments, critical to the long term health and subsequent regeneration of your revegetation communities. By collecting seeds or cuttings from remnants within your region you improve your chances of capturing and maintaining local adaptations. You should collect propagation material evenly from at least fifteen and up to fifty plants. Be sure that you hold a current collection permit and that you have permission from the owner or manager of the remnant.

## Propagation techniques

### Seed

Seeds are a convenient and efficient means of propagation for the majority of plants of this region. In most years, they can be collected and stored easily in large enough quantities to maintain adequate levels of genetic diversity in their progeny. For most revegetation programs, growing plants from seed will be the most frequently employed propagation technique for both herbaceous and woody plants.

The basic requirements for successful seed propagation are germinable seed, a clean, well drained growing medium, sufficient moisture and a suitable temperature environment. For most species, if your seed is germinable, the medium is moist and

temperatures are within the range of 10o C to 25o C, you should have germination within one to eight weeks of sowing. Having a greenhouse or shade-house available will increase your flexibility, but for local species it may be enough to sow in the plant's usual season for germination.

For annuals and perennial herbaceous plants, it is usual to broadcast seed evenly onto the surface of the growing medium and cover the seed lightly. The seedlings can be transplanted into individual containers filled with fertilised growing medium, within a few days of germination. If you have plenty of seed, an alternative is to sow lightly over the surface of your final containers, filled with fertilised growing medium. You may get more than one plant growing in each container, but for grasses and most other herbaceous plants this will not matter. This technique avoids transplanting and should shorten the time plants need to be in the nursery.

When growing seedlings of shrubs and trees, I strongly recommend that you do not transplant your seedlings during the nursery production phase. The root systems of trees and shrubs can be distorted and damaged permanently if they are transplanted as young seedlings. This damage can lead to unstable plants and premature death on the revegetation site. A safer technique is to sow a small number of seeds into an individual tree tube (or similar container) filled with fertilised growing medium. When more than one seed germinates, remove excess seedlings by clipping them off below the first leaves. Do not pull out the seedlings as this can disturb the root system of the remaining plant.

Sometimes seed will not germinate even though the growing medium and environment should suit the species. It may be that the seed is dead, or some form of seed dormancy may cause the problem. It can be difficult to decide whether seed is healthy simply by inspection. However, looking at your seed under magnification may reveal evidence of insect damage. Another test is to soak a sample of seed on a moist tissue for a few days. If the seed rots quickly, it is likely that the seed lot is either dead or in poor condition. Squash or cut a few seeds. If the internal structures are sound, it indicates the seed is probably healthy.

Seed dormancy can come in many forms. Some types of seed dormancy are easily dealt with but others are poorly understood and difficult to overcome. One common form of dormancy is hardseededness. Many legumes, such as the various peas and the wattles, have hard seed coats. In nature, seeds with hard coats may not germinate for many years. Once the hard seed coat has been breached and water reaches the embryo, germination usually follows quickly. One practical method for breaching the seed coat is to rub the seed against or between abrasive surfaces such as sandpaper. This method suits a range of hard seeded species, not just the legumes. A popular method, specifically for legumes, is to soak the seed in hot or boiling water. Both methods need some initial experiments with small samples of seeds to assess the intensity and duration of treatment. Some species, particularly those from districts that experience cold winters, require a cool moist period before they will germinate. In the nursery, this can be achieved by placing the freshly sown and watered seed into a cold room or refrigerator at about 4o C for a period of from one to possibly as long as twelve weeks. Once the treatment is finished, place the container in a normal germination environment.

Many other species produce seed that is dormant for a short time only. In nature this allows time for a seed to be dispersed away from the immediate competition of its parent or it delays germination until seasonal conditions will better suit the establishing seedling. Often these seeds will gradually lose their dormancy when kept in dry storage for a period of from one to several months.

In recent years the application of plan-derived smoke has been shown to increase germination for many species. Products such as smoke water and smoke vermiculite are available commercially and are suitable for use in plant nurseries.

## Cuttings

Cutting propagation is most likely to be useful for perennial herbaceous plants and shrubs. Growing a plant from a cutting produces a clone of the parent plant. For revegetation, plants already growing successfully in an area can be replicated and planted

into similar sites. In conventional nursery production, only one plant may be used as a source for cuttings. For revegetation the 'fifteen to fifty' rule of thumb should be applied. Collect cuttings evenly from fifteen to fifty different plants to maintain diversity and local adaptations in the next generation.

Growing plants from cuttings is generally more demanding than seed propagation. The cuttings must be in the right stage of growth (usually semi-mature, current season's growth), they must not dehydrate at any stage and they will have to be kept in a highly modified environment until they form roots. The environment is usually modified by installing mist or fog systems into a greenhouse, or by covering containers or beds of cuttings with thin plastic film. The growing medium is usually more freely drained than other media and can comprise materials such as clean sand, composted wood wastes, perlite or peat. High quality commercial cutting mixes are readily available.

When propagating cuttings, it is common practice to apply root promoting plant growth regulators (auxins) to the base of the cutting stem. These products are available in a range of concentrations in commercial formulations that may be powders, liquids or gels. They may or may not help strike your species but, applied correctly, they are not likely to be harmful.

The time taken to strike cuttings can vary enormously within a batch of cuttings, between species and with the season the cuttings are taken. Keep your cuttings moist but not saturated and be prepared to wait, particularly for cuttings collected from plants in the wild.

Cutting propagation is a very useful technique, particularly when seed propagation is not practical. It can be used to maintain successful local forms, but being a clonal technique, it is important that cuttings are collected from a suitable number of representative plants.

## Division

Division is another clonal technique that can be very useful for propagating clump, mat and bulb forming plants such as grasses, reeds and lilies. The parent

plant is divided by hand or with a clean, sharp blade. Retain, when present, stem, leaves and roots on each division. Plant each division into an individual container filled with fertilised growing medium. Usually, no special growing environments are needed, although the season in which the division is done may

## Growing-on

Whether propagating from seeds, cuttings or divisions, the growing of the plants and their preparation for field planting is a critical phase. For ease of transport and planting, the final container should be as small as possible, while allowing for enough growth and root volume for the plant to establish quickly even when field conditions are less than ideal. Plants should be grown under conditions that prepare them for the field site. This could be in the full sun, in filtered shade under a tree canopy, or in a light shade house which will afford protection from storms and drying winds. The plant's medium must not dry out. Once a wood waste growing medium dries, it can be very difficult to re-wet. Top growth should be controlled so that it grows relatively slowly. This can be done by growing in high light and by keeping nutritional levels and watering in balance with the plant's needs. At transplanting, the plant's root system should hold the medium together without being pot bound. A plant that has been held in the container for too long, generally will be slow to establish when transplanted. It will be very susceptible to drought through the failure of its root system to make new growth into the surrounding soil.

## Conclusion

The propagation and growing of plants for revegetation is a fascinating and rewarding activity. The grower comes to know where and how to collect suitable propagation material, the best techniques for each species and how best to prepare well grown, diverse plants for transplanting into the revegetation site.

# PROPAGATION SUMMARY

---

## Growing system

- **containers** - use clean, light containers that are well drained and designed to avoid root circling
- **growing medium** - use clean mixes that meet the Australian standard
- **fertilisers** - add commercial controlled release fertilisers; select low phosphorous formulations for phosphorous-sensitive plants

## Seed

- collect seed from local remnants to retain local forms
- collect seed from as many separate plants as practicable (at least 15 and up to 50)
- check the quality and germination of seed before sowing
- when growing trees and shrubs, avoid root damage by sowing directly into the final container

## Cutting propagation

- growing plants from cuttings collected from remnants ensures successful forms are propagated
- cutting propagation is generally more difficult than other forms of propagation
- collect cuttings from as many separate plants as practicable (at least 15 and up to 50)

## Division

- many mat, clump and bulb forming plants can be propagated easily by division
- propagate from as many separate plants as practicable (at least 15 and up to 50)

## Transplanting on to site

- prepare plants for site conditions - increase light levels, reduce watering and reduce nutrition
- transplant when the plant's root system can hold the growing medium together but before the plant becomes root-bound.

## Appendix 5:

### Propagation information for Species of the Goulburn Broken Catchment

Species	Common Name	Propagation Notes
<i>Acacia species</i>	Wattles	Boiling water treatment. Pour boiling water over seed & soak from 12 to 20 hours before sowing.
<i>Ajuga australis</i>	Austral Bugle	Propagate from seed.
<i>Allocasuarina luehmannii</i>	Buloke	May prefer cooler temperatures to germinate. Stratification may enhance germination.
<i>A. verticillata</i>	Sheoke	Prefers hotter temperatures to germinate.
<i>Amphibromus species</i>	Swamp Wallaby-grass	Should germinate readily from seed.
<i>Arthropodium strictum</i>	Chocolate Lily	Store seed 2-3 months before sowing. Prefers cooler temperatures to germinate.
<i>Atriplex semibaccata</i>	Berry Saltbush	Soak seed in water for an hour to remove salt before sowing. No need to remove seed from fruit before sowing.
<i>Austrodanthonia spp.</i>	Wallaby grasses	Surface-sow seed.
<i>Austrostipa spp.</i>	Spear grasses	Store seed for 1 year before sowing in autumn or spring.
<i>Baeckia utilis</i>	Mountain Baeckia	Cover seed lightly, may benefit from capillary watering.
<i>Banksia marginata</i>	Silver Banksia	Sow fresh seed. Stratification for 6-10 weeks will enhance germination.
<i>Billardiera scandens</i>	Common Apple-berry	Sow fresh seed. May take several months to germinate. Smoke treatment beneficial.
<i>Bothriochloa macra</i>	Red-leg Grass	Seedlings may establish slowly.
<i>Brachychiton populneus</i>	Kurrajong	Soak seeds in hot water for 12 hours before sowing. Sow directly into large pots/1 litre milk cartons.
<i>Brachyscome basaltica</i>	Swamp Daisy	Sow in autumn.
<i>Bracteantha bracteata</i>	Golden Everlasting	May need to store seed for 3-6 weeks before sowing.
<i>B. viscosa</i>	Sticky Everlasting	As above
<i>Brunonia australis</i>	Blue Pincushion	Use fresh seed.
<i>Bulbine bulbosa</i>		Bulbine Lily Store seed 2-3 months before sowing. Prefers cooler temperatures to germinate.
<i>Burchardia umbellata</i>	Milkmaids	Store seed 2-3 months before sowing. Sow in autumn.
<i>Bursaria lasiophylla</i>	Hairy Bursaria	Sow fresh seed and cover with cardboard to keep dark. Takes a few months to germinate. Remove cardboard as soon as germination starts.
<i>B. spinosa</i>	Sweet Bursaria	As above.

Species	Common Name	Propagation Notes
<i>Callistemon pallidus</i>	Lemon Bottlebrush	Prefers cooler temperatures to germinate.
<i>C. pityoides</i>	Alpine Bottlebrush	As above
<i>C. sieberi</i>	River Bottlebrush	As above
<i>Callitris endlicheri</i>	Black Cypress Pine	20°C best germination temperature. Germinates and grows slowly.
<i>C. glaucophylla</i>	White Cypress Pine	Germinates and grows slowly.
<i>Calocephalus citreus</i>	Lemon Beauty-heads	Surface sow seed.
<i>Calytrix tetragona</i>	Common Fringe-myrtle	Best grown from cuttings. Seed is unreliable.
<i>Carex appressa</i>	Tall Sedge	Bog method. Stand seed tray in water so it is continually wet.
<i>Cassinia aculeata</i>	Common Cassinia	May need to store seed for 3-6 weeks before sowing. Surface Sow
<i>C. arcuata</i>	Drooping Cassinia	As above
<i>C. longifolia</i>	Shiny Cassinia	As above
<i>Cheiranthera cyanea var. cyanea</i>	Blue Finger Flower	Propagate by seed or cuttings.
<i>Joycea pallida</i>	Red-anther Wallaby Grass	Smoke treatment appears to improve germination.
<i>Chloris truncata</i>	Windmill Grass	Store seed for 1 year before sowing. Can direct seed into pots. Germinates in 2-3 weeks.
<i>Chrysocephalum apiculatum</i>	Common Everlasting	May need to store seed for 3-6 weeks before sowing.
<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	As above.
<i>Clematis aristata</i>	Mountain Clematis	Sow fresh seed. May take 1-3 months to germinate.
<i>C. microphylla var. microphylla</i>	Small-leaved Clematis	As above.
<i>Convolvulus erubescens</i>	Pink Bindweed	Scarify seed.
<i>Coprosma hirtella</i>	Rough Coprosma	Sow fresh seed. Remove flesh from seed before sowing.
<i>C. quadrifida</i>	Prickly Currant-bush	Sow fresh seed. Remove flesh from seed before sowing.
<i>Correa laurenciana</i>	Mountain Correa	May take up to 5 months to germinate. Best grown from cuttings, seed contains a chemical inhibitor which can take weeks to leach.
<i>C. reflexa</i>	Common Correa	As above, some success with seed at warmer temperatures.
<i>Craspedia species</i>	Billy-buttons	May need to store seed for 3-6 weeks before sowing. Bog method. Stand seed tray in water so it is continually wet.
<i>Cyperus lucidus</i>	Leafy Flat-sedge	Bog method. Stand seed tray in water so it is continually wet.
<i>Daviesia benthamii subsp. humilis</i>	Spiny Bitter-pea	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>D. latifolia</i>	Hop Bitter-pea	As above.
<i>D. leptophylla</i>	Narrow-leaf Bitter-pea	As above

Species	Common Name	Propagation Notes
<i>Dianella longifolia</i>	Pale Flax-lily	Germinates well with/without fermentation.
<i>D. revoluta</i>	Black-anther Flax-lily	Smoke treatment beneficial.
<i>D. tasmanica</i>	Tasman Flax-lily	Germinates well without fermentation.
<i>Dichelachne species</i>	Plume-grass	Good results from seed.
<i>Dillwynia cinerescens</i>	Grey Parrot-pea	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>D. juniperina</i>	Prickly Parrot-pea	As above.
<i>D. phyllicoides</i>	Small-leaf Parrot-pea	As above.
<i>D. sericea</i>	Showy Parrot-pea	As above.
<i>Dodonaea viscosa ssp. angustissima</i>	Narrow-leaf Hop-bush	Boiling water treatment. Pour boiling water over angustissima seed & soak for at least ½ an hour before sowing.
<i>D. viscosa ssp. cuneata</i>	Wedge-leaf Hop-bush	As above
<i>Einadia hasata</i>	Saloop	Germinates from seed in 2-5 weeks.
<i>E. nutans subsp. nutans</i>	Nodding Saltbush	Germinates from seed in 2-5 weeks
<i>Elymus scaber</i>	Tall Wheat-grass	Propagates readily from seed.
<i>Enchylaena tomentosa var. tomentosa</i>	Ruby Saltbush	Germinates readily from seed. No need to remove seed from fruit before sowing. Soak seed in water for an hour to remove salt before sowing.
<i>Enneapogon nigricans</i>	Nigger-heads	Store for at least 3 months after collection. Sow spring-summer.
<i>Enteropogon acicularis</i>	Spider Grass	May have after ripening requirement so store for 6-12 months after collection.
<i>Epacris species</i>	Heath	Difficult from seed but bog and capillary methods with smoke treatment can give good results. Otherwise use firm young cutting material.
<i>Eremophila longifolia</i>	Berrigan	Very difficult to germinate from seed. Stem cuttings can be slow to root.
<i>Eryngium ovinum</i>	Blue Devil	Germinates 3-4 weeks after sowing seed.
<i>Eucalyptus species</i>	Eucalypts	Eucalypts generally germinate in 2-4 weeks & most prefer 25-30°C to germinate. Direct seeding into pots tends to produce the best root system. Snip off excess plants with scissors rather than pulling them out (as this may distort the roots of remaining plant).
<i>Eucalyptus albens</i>	White Box	Germinates best at 25°C.
<i>E. behriana</i>	Bull Mallee	Germinates readily in 2-4 weeks.
	Blakleys Red Gum	Germinates best at 25-30°C.
<i>E. bridgesiana</i>	But But	25°C optimum germination temperature.
<i>E. cadens</i>	Warby Swamp Gum	
<i>E. camaldulensis</i>	River Red Gum	35°C best germination temperature.
<i>E. camphora</i>	Mountain Swamp Gum	25°C optimum germination temperature.
<i>E. spp. aff. cinerea</i>	Beechworth Silver Stringybark	
<i>E. crenulata</i>	Buxton Gum	

Species	Common Name	Propagation Notes
<i>E. dalrympleana</i>	Mountain Gum	27°C optimum germination temperature.
<i>E. dives</i>	Broad-leaved Peppermint	15°C best germination temperature. Stratification enhances germination.
<i>E. froggatti</i>	Kamarooka Mallee	
<i>E. globulus ssp. bicostata</i>	Eurabbie/Blue Gum	27°C optimum germination temperature.
<i>E. goniocalyx</i>	Long-leaf Box	25°C optimum germination temperature.
<i>E. globoidea</i>	White Stringybark	16°C best germination temperature.
<i>E. largiflorens</i>	Black Box	
<i>E. leucoxydon ssp. pruinosa</i>	Yellow Gum	
<i>E. macrorhyncha</i>	Red Stringybark	16°C optimum germination temperature.
<i>E. mannifera</i>	Brittle Gum	25°C optimum germination temperature.
<i>E. melliodora</i>	Yellow Box	27°C optimum germination temperature.
<i>E. microcarpa</i>	Grey Box	
<i>E. nortonii</i>	Silver Bundy	25°C optimum germination temperature.
<i>E. obliqua</i>	Messmate Stringybark	
<i>E. ovata</i>	Swamp Gum	
<i>E. pauciflora</i>	Snow Gum	Stratify in moist sand in refrigerator for ~ 4-6 weeks before sowing.
<i>E. polyanthemos ssp. vestita</i>	Red Box	32°C optimum germination temperature.
<i>E. radiata</i>	Narrow-leaf Peppermint	
<i>E. rubida</i>	Candlebark	27°C optimum germination temperature.
<i>E. sideroxydon</i>	Mugga Ironbark	
<i>E. tricarpa</i>	Red Ironbark	
<i>E. stellulata</i>	Black Sallee	Stratify in moist sand in refrigerator for ~ 4-6 weeks before sowing.
<i>E. stellulata</i>	Black Sallee	Stratify in moist sand in refrigerator for ~ 4-6 weeks before sowing.
<i>E. viminalis</i>	Manna Gum	27°C optimum germination temperature.
<i>E. viridis</i>	Green Mallee	
<i>Eutaxia diffusa</i>	Spreading Eutaxia	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>E. microphylla</i>	Common Eutaxia	As above.
<i>Glycine clandestina</i>	Twining Glycine	As above.
<i>Glycine tabicina</i>	Variable Glycine	As above.
<i>Gompholobium huegelii</i>	Common Wedge-pea	As above.
<i>Isotoma axillaris</i>	Rock Isotome	Propagates readily from seed in 4-6 weeks.
<i>Hakea microcarpa</i>	Small-fruit Hakea	Germinates well from fresh seed.
<i>Hardenbergia violacea</i>	Purple Coral-pea	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>Hymenathera dentata</i>	Tree Violet	Sow fruit containing seed a few centimetres deep. Takes a few months to germinate. No need to extract seed from fruit before sowing.
<i>Indigofera adesmiifolia</i>	Tick Indigo	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.

Species	Common Name	Propagation Notes
<i>I. australis</i>	Austral Indigo	As above
<i>Juncus spp.</i>	Rushes	Bog method. Stand seed tray in water so it is continually wet.
<i>Kennedia prostrata</i>	Running Postman	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>Kunzea ericoides</i>	Burgan	Prefers cooler temperatures to germinate.
<i>K. parvifolia</i>	Violet Kunzea	As above
<i>Leptorhynchos squamatus</i>	Scaly Buttons	Store seed for 3-6 months after collection.
<i>Leptospermum brevipes</i>	Slender Tea-tree	Prefers cooler temperatures to germinate.
<i>L. continentale</i>	Prickly Tea-tree	As above
<i>L. grandifolium</i>	Mountain Tea-tree	As above
<i>L. lanigerum</i>	Woolly Tea-tree	As above
<i>L. obovatum</i>	River Tea-tree	As above
<i>Lomandra filiformis</i>	Wattle Mat-rush	Probably as for <i>L.longifolia</i> .
<i>L. longifolia</i>	Spiny-headed Mat-rush	Sow fresh seed. Germinates slowly but reliably.
<i>L. multiflora</i>	Many-flowered Mat-rush	As above.
<i>Lythrum salicaria</i>	Purple Loose-strife	Seed germinates readily or from cuttings.
<i>Maireana decalvans</i>	Black Cotton-bush	Germinates readily from seed, seed loses viability after a year or so.
<i>M. enchylaenoides</i>	Wingless Bluebush	Germinates readily from seed, seed loses viability after a year or so.
<i>Melaleuca parvistaminea</i>	Rough-barked Honey-myrtle	Prefers cooler temperatures to germinate.
<i>Microlaena stipoides</i>	Weeping Grass	Germinates readily.
<i>Mirbelia oxylobioides</i>	Mountain Mirbelia	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>Pelargonium australe</i>	Australe Stork's-bill	Readily propagated from seed and cuttings.
<i>Pelargonium rodneyanum</i>	Magenta Stork's-bill	Readily propagated from seed and cuttings.
<i>Phragmites australis</i>	Common Reed	Bog method. Stand seed tray in water so it is continually wet.
<i>Pittosporum phylliraeoides</i>	Weeping Pittosporum	Remove germination inhibitor by washing sticky coating off with warm water & detergent, separate with sieve, sow with dry sand.
<i>Platylobium formosum</i>	Handsome Flat-pea	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>Poa species</i>	Tussock Grass	Stratifying seed for three weeks may improve germination.
<i>Pultenaea cunninghamii</i>	Grey Bush-pea	Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>Pycnosorus globosus</i>	Drumsticks	May have 3 month after ripening period.
<i>Stypandra glauca</i>	Nodding Blue-lily	From seed in autumn, may be difficult to grow from seed.

Species	Common Name	Propagation Notes
<i>Swainsona species</i>		Boiling water treatment. Pour boiling water over seed & soak for at least ½ an hour before sowing.
<i>Themeda triandra</i>	Kangaroo Grass	Store at 4°C for one month to break dormancy before sowing.
<i>Thysanotus patersonii</i>	Twining Fringe-lily	Variable germination success, smoke treatment may improve results.
<i>Wahlenbergia species</i>	Bluebell	Seeds may have a 4-6 month after-ripening period. Stratification for 3 months at 3-5°C may improve germination.
<i>Xanthorrhoea australis</i>	Austral Grass-tree	From fresh seed. Takes 3 weeks to 12 months to germinate. Seedlings develop slowly initially.
<i>X. minor</i>	Small Grass Tree	As above

## References:

---

Greening Australia,  
1996-1998, *Seed Germination Data Sheets*.

Ralph, M.,  
1997, *Growing Australian Native Plants from Seed*, Murray Ralph/Bushland Horticulture, Melbourne.

Earl, G et-al (ed),  
2001, *Revegetation Guide for the Goulburn Broken Catchment*, Department of Natural Resources & Environment, Melbourne.

For further information or to place  
an order contact:

The Seedbank Coordinator

Phone: (03) 5833 9279

Fax: (03) 5833 9201

Mob: 0428 770 030

Email: [stafford@unimelb.edu.au](mailto:stafford@unimelb.edu.au)

